

Docket No. 520.43302PX1
Serial No. 10/724,750
Office Action dated September 16, 2005

REMARKS

I. Introduction

By the present Amendment, claims 1, 2, 4, and 5 have amended, and claim 3 canceled. Claims 6 and 7 are newly presented for consideration. Accordingly, claims 1, 2, and 4-7 are now pending in the application. Claims 1, 4, 6, and 7 are independent.

II. Office Action Summary

In the Office Action of September 16, 2005, claims 1-5 were rejected under 35 UC §102(e) as being anticipated by U.S. Patent No. 6,404,498 issued to Maeda, et al. ("Maeda"). This rejection is respectfully traversed.

III. Rejections under 35 USC §102

The Office Action rejects claims 1-5 as being anticipated by Maeda. Regarding this rejection, the Office Action alleges that Maeda discloses a method for inspecting defects that comprises all of the steps recited in independent claim 1. For example, the Office Action indicates that Maeda discloses detecting an image signal of the transmission light reflected from the surface of the inspection object, and detecting defects on the surface of the inspection object by processing the detected image signal. In particular, the Office Action indicates that Maeda discloses selective shielding of the diffraction light pattern by a shielding plate during the detecting step. As amended, independent claim 1 defines a method for inspecting defects that comprises the steps:

illuminating light to an inspection object containing repetitive circuit patterns formed on a surface thereof;
detecting an image signal corresponding to transmission light by selectively shielding a diffraction light pattern generated from said

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repetitive circuit patterns when the illuminating light is reflected from the surface of said inspection object; and
detecting the defects existing on the surface of the inspection object by processing the detected image signal;
wherein said selective shielding of said diffraction light pattern in said detecting step is performed by using a micro-mirror array device or a reflected type liquid crystal, or a transmission type liquid crystal, or an object which is transferred a shielding pattern to an optically transparent substrate, or a substrate or a film which is etched so as to leave shielding patterns, or an optically transparent substrate which can be changed in transmission by heating, sudden cold, or light illumination, or change of electric field or magnetic field, or a shielding plate of cylindrical shape or plate shape.

According to the inspection method of claim 1, light is illuminated onto an inspection object that contains repetitive circuit patterns formed on a surface thereof. An image signal corresponding to transmission light is detected by selectively shielding a diffraction light pattern generated from the repetitive circuit patterns. The diffraction light pattern occurs when the illuminating light is reflected from the surface of the inspection object. The detected image signal is then processed in order to detect defects that exist on the surface of the inspection object. According to the invention defined by independent claim 1, the diffraction light pattern can be shielded in various ways. For example, selective shielding can be performed using a micro-mirror array device or a reflected type liquid crystal; a transmission type liquid crystal; an object which transfers a shielding pattern to an optically transparent substrate; a substrate or film that is etched so as to leave shielding patterns; an optically transparent substrate whose light transmittance level can be changed by heating, cooling, and illumination, or a change in the electric or magnetic field.

The Office Action indicates that Maeda discloses the features recited in independent claim 1. Based on Applicants' review, however, the features recited by Maeda appear to be different from those recited in independent claim 1. Maeda discloses a pattern detection method and apparatus for detecting defects on an

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inspected object. Maeda provides an attenuation filter on a pupil plane conjugated with the pupil plane of the objective lens, and two-dimensional or one-dimensional image sensors. See column 7, lines 3-8. The attenuation filter of Maeda is used to attenuate the 0th order diffraction light introduced into the objective lens. See column 8, lines 30-33. Maeda also indicates that the 0th order diffraction light can be prevented from being received by the image sensor using an attenuation filter for partly controlling the same light intensity as the masked element. The attenuation filter used by Maeda appears to be used only for controlling the quantity of the 0th order diffraction light in order to correspond with a diaphragm of a camera. See Fig. 17. In contrast, the present invention applies a spatial filter to selectively shield the diffracted light pattern coming from the repetitive circuit patterns, as illustrated in Figs. 15-18. This particular feature does not appear to be disclosed or suggested by Maeda.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claim 2 depends from independent claim 1, and is believed to be allowable for at least the reasons set forth above with respect to independent claim 1. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

As amended, independent claim 4 defines an apparatus for inspecting defects that comprises:

an illumination optical system which illuminates light to an inspection object containing repetitive circuit patterns formed on a surface thereof;

an optical detection system which detects light reflected from said inspection object and transmitted through a shield unit, and converts the detected light into an image signal; and

a processing system which detects the defects by processing the image signal detected by said optical detection system;

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wherein said shield unit is provided in said optical detection system to selectively shield diffracted light patterns coming from the repetitive circuit patterns existing on the inspection object; and said shielding unit comprises a micro-mirror array device or a reflected type liquid crystal, or a transmission type liquid crystal, or an object which is transferred a shielding pattern to an optically transparent substrate, or a substrate or a film which is etched so as to leave shielding patterns, or an optically transparent substrate which can be changed in transmission by heating, sudden cold, or light illumination, or change of electric field or magnetic field.

According to the apparatus of claim 4, an illumination optical system illuminates light onto an inspection object that contains repetitive circuit patterns. An optical detection system is used to detect light reflected from the inspection object and transmitted through a shield. The optical detection system also converts the detected light into an image signal. A processing system is then used to detect the defects by processing the image signal detected by the optical detection system. Similar to independent claim 1, diffracted light patterns coming from the repetitive circuit patterns formed on the inspection object are selectively shielded.

As discussed with respect to independent claim 1, this particular feature is not disclosed or suggested by Maeda. Rather, Maeda appears to provide an attenuation filter that is used only for attenuating the 0th order diffraction light introduced into the pupil of the objective lens.

It is therefore respectfully submitted that independent claim 4 is allowable over the art of record.

Claim 5 depends from independent claim 4, and is therefore believed allowable for at least the reasons set forth above with respect to independent claim 4. In addition, this claim introduces novel elements that independently render it patentable over the art of record.

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Claims 6 and 7 are newly presented and recite features similar to those recited in independent claims 1 and 4, respectively. For example, claim 6 recites a step of "detecting an image signal of transmission light by selectively shielding diffraction light pattern generated from said repetitive circuit patterns when light is reflected from the surface of said inspection object."

Similarly, independent claim 7 recites the feature of selectively shielding the "diffraction light patterns coming from the repetitive circuit patterns existing on the inspection object...." These features do not appear to be shown or suggested by the art of record.

It is therefore respectfully submitted that independent claims 6 and 7 are allowable over the art of record.

IV. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.


If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

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AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 520.43302PX1).

Respectfully submitted,
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